An unusual record of Quebracho Crested Tinamou *Eudromia formosa* from the dry Chaco of Paraguay, with comments on distribution, breeding and vocalisations of the species

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SUMMARY.—An unusual record of Quebracho Crested Tinamou *Eudromia formosa*, found dead on the roof of a building with an egg partially extruding from its cloaca, is reported. A description of the egg and morphometric data for the specimen are provided. We also present details of field observations and vocalisations of this little-known species in both Paraguay and Argentina, while its distribution in Paraguay, Argentina and Bolivia is clarified.

Of the two species of 'crested tinamou' in the genus *Eudromia*, only Quebracho Crested Tinamou *E. formosa* occurs in Paraguay (Davies 2002, Clay & del Castillo 2004). It is a Chaco endemic (Short 1975) of semi-open areas adjacent to dense, xerophytic, thorny forest with open or dense undergrowth. Clay & del Castillo (2004) considered the species scarce in the Alto Chaco of Paraguay, but our observations suggest that it is fairly numerous in the most arid regions of the northern Chaco, beyond km 620 of the Ruta Trans-Chaco. The Paraguayan population was formerly separated as *E. f. mira* (Short 1975, Banks 1977) on account of its browner plumage and broader but less well-defined shaft-streaks on the upperparts. However, subsequently the species has been usually treated as monotypic (Blake 1977, Navas & Bó 1981, Davies 2002), although Cabot (1992) hesitantly recognised *mira*, while noting confusion concerning the overlap zone and that *E. formosa* may 'better be considered monospecific'.

Distribution

In Paraguay, *E. formosa* is more numerous in the driest areas of the Alto Chaco (dpto. Boquerón). It is recorded regularly between Parque Nacional Agripino Teniente Enciso and Parque Nacional Médanos del Chaco, where small groups are commonly seen on roads during late afternoon, but much less frequently further south, with the southernmost observation by the authors at Fortín Toledo (22°19'S, 60°21'W). This area lies outside the range mapped by Short (1975) and more recently Echarri *et al.* (2008), who both consider the Central Chaco (a highly modified area of succession from Humid to Dry Chaco habitat) as the focal point of the species' Paraguayan range. Echarri *et al.* (2008) modelled the distribution of *Eudromia* tinamous and compared the results with published data, concluding that the two corresponded well, leading to the conclusion that *E. formosa* occurs in warmer and wetter areas than Elegant Crested Tinamou *E. elegans*. However, their analysis did not include the information in Guyra Paraguay (2005), which most accurately maps the species' known range in Paraguay and reveals a distinct preference for the most arid parts of the Paraguayan Chaco.

Field observations over several years by the authors suggest that the species is rare in the Central Chaco (heard just once there by PS in seven years of intermittent field work) and that this area probably represents the eastern limit of the species' Paraguayan

range (Guyra Paraguay 2005), it becoming more numerous farther north and west in the Paraguayan Chaco. The discrepancy between published sources and our data probably represents a historical lack of observer effort in the northern Paraguayan Chaco which was, until recently, relatively inaccessible to visitors, or a recent shift in the species' range due to extensive agricultural activity in the Central Chaco since the arrival of the Mennonites in the 1930s and / or climatic changes.

In northern Argentina, the species occurs in eastern Salta, northern Santiago del Estero, western Formosa and western Chaco provinces (MP pers. obs.), having also been collected historically in Tucumán (Olrog 1959), where it is now believed extinct (F. Moschione pers. comm.). Mention (without evidence) of 9 de Julio department in north-western Santa Fe (Giai 1950), if correct, may also reflect the species' former range.

In Bolivia the species was observed in dpto. Tarija in 1973 (J. R. Mata *in* Olrog 1979; J. R. Mata pers. comm.) and a chick initially identified as *E. elegans* (Banks 1977) was thought more likely to be *formosa* by Remsen & Traylor (1983, 1989). *E. formosa* was not listed for Bolivia by Hennessey *et al.* (2003) but was included among those species requiring confirmation, jointly with *E. elegans*. Fernández *et al.* (2009) summarised modern records from Bolivia, including new localities in Tarija and Gran Chaco.

Unusual specimen record

On 11 July 2006, a freshly dead adult female Quebracho Crested Tinamou was found on a low (*c.*3 m high) sloping roof at the Parque Nacional Agripino Teniente Enciso (21°15'S, 61°40'W) headquarters, immediately adjacent to a perpendicular brick wall. The bird was

Figure 1. Ventral view of dead Quebracho Crested Tinamou *Eudromia formosa*, showing the lime-green egg, Parque Nacional Teniente Agripino Enciso, Paraguay, 11 July 2006 (Paul Smith)

well preserved, though fly larvae were present on a small area of the right thigh, and it was estimated to have been dead no more than 36 hours.

In the days prior to the discovery, Parque Nacional Agripino Teniente Enciso had experienced high, hot winds from the north, presumably sufficient to affect the maneuverability of an airborne tinamou. Tinamous are incapable of sustaining their initial burst of powerful flight due to a small heart (0.19–0.25% of total body weight) providing insufficient blood flow to the well-developed pectoral muscles (Davies 2002). The dead bird was *c.*1 m from the wall, with the ventral surface face down and neck extended. An examination of the corpse revealed no visible head injuries or broken neck or wing bones that would be consistent with a collision with a hard surface, nor any signs of predation. A uniform lime-green egg half-protruded from the cloaca. Tinamous are known to occasionally 'drop eggs' under stressful conditions such as capture (R. Clay pers. comm.) and it is probable that the egg's appearance in this case was a stress response. Lime-green and ovoid, the egg was partially broken, with liquid yolk and albumen still present. It measured 36 mm at its widest point (which was still intact) and overall length was estimated at *c.*65 mm, although the largest fragment was only 51 mm. This is longer and narrower than published measurements for eggs of *E. elegans*: 57.1 mm (± 0.97) × 39.4 mm (± 0.45) (Davies 2002).

De la Peña (1978) provided measurements of approximately 53–55 × 40–41 mm for Quebracho Crested Tinamou, and described a clutch of up to 11 lustrous yellowish eggs. However, it seems probable that these were sun-bleached, and the dimensions so closely match those of Elegant Crested Tinamou that these data are probably best treated with caution. It also is noteworthy that de la Peña (1978) included north-west Santa Fe, Argentina, within the range of Quebracho Crested Tinamou, whereas *Eudromia* specimens collected there pertain to *E. elegans magnistrata* (Ordano & Bosisio 1997). Otherwise the only published data concerning the eggs of *E. formosa* come from Steinbacher (1962) who, quoting the renowned Mennonite collector J. Unger, stated that the eggs are green and clutch size is 7–9 eggs. He added that the nest is 'normally located near the road', though this presumably reflects the ease in finding nests located close to roads as opposed to those in thorn forest.

Dissection of the specimen revealed no additional eggs within the oviduct. Steinbacher (1962) mentioned two females collected in Paraguay by Unger in November 1955 with well-developed gonads and declared this to be indicative of the species' breeding season. However, a male collected on 13 March 1957 also had well-developed gonads and Unger collected a 'partly grown immature female' in December (year unknown: Short 1976). Adding our record from July (midwinter in Paraguay) and the fact that warm year-round temperatures in the Chaco permit non-seasonal breeding for some species adapted to xerophytic conditions, it appears that breeding occurs throughout the year in Paraguay. Cabot (1992) noted that birds collected in February in Argentina were in breeding condition and a bird taken 60 km north of Fuerte Esperanza, dpto. General Guemes, Chaco, Argentina, in August had an egg in its oviduct, supporting the possibility of year-round breeding elsewhere in the species' range.

Due to permit constraints the specimen was not collected so we include here a plumage description, a photograph of the bird (Fig. 1) and morphometric data for this little-known, range-restricted species.

Measurements.—(Data in parentheses concern females collected in Paraguay, from Blake 1977): bill from gape to tip 37 mm; exposed culmen 25 mm (27.0–32.5 mm, mean 28.5 mm, $n = 4$); head and bill from nape to bill tip 60 mm; bill depth at middle of nares 8.5 mm; bill width at nares 8.5 mm; bill tip to nares 14 mm; tarsus 55 mm (48–53 mm, mean 50.5 mm,

n = 2); middle toe 27.5 mm; wing chord 210 mm (flat wing 211–229 mm, mean 217.3 mm, *n* = 6); crest to base of bill 67 mm.

Vocalisations

During field work at Parque Nacional Agripino Teniente Enciso, dpto. Boquerón, on 2–29 July 2006, the species was recorded daily by sight or aurally. Birds were most frequently encountered in small groups of up to four, although singles were occasionally seen. They vocalised throughout the day, especially in the early morning (*c*.06.30–08.00 h) and late afternoon (*c*.16.30–18.00 h). Steinbacher (1962) stated that the species can often be heard deep into the night and our field work in Paraguay supports this. In Argentina the species has been heard vocalising up to 40 minutes before dawn and after dusk during the austral spring (MP pers. obs.). We distinguished five different vocalisations:

Advertising call.—A slow, descending double-whistled *foooo-ip foo-ip*, the first part more drawn-out. Occasionally a third, quieter *foo-ip* is added. Given most frequently at dawn and dusk, and only sporadically throughout the day. The most frequently heard of all vocalisations, with individual singing bouts sometimes lasting 30+ minutes. A recording is available at www.xeno-canto.org (XC15601). A variation or different dawn voice is *fooouuu-ip fup-fup-fup-fup-fup-fup* with a flatter succession of up to six final notes at a rate of two per second. At dusk gives a variant *foooo fp-fp*.

Contact call?—A double or triple, falsetto *fee-fee* or *fee-fee-fee*, resembling but slightly lower than a common vocalisation given by Purple-throated Euphonia *Euphonia chlorotica*. Given most frequently in the middle of the day for short periods. Similar and perhaps analogous to that on Hardy *et al.* (1995), although the calls we heard were slightly lower pitched and more even in tone.

Alarm call?—An explosive, triple *POO-IT POO-IT POO-IT* resembling the advertising call in form, but differing in its rapid, explosive delivery. Heard only once, the source of the presumed threat was not apparent.

A single rising falsetto *foo-WEE* of uncertain significance heard only once, at 11.00 h on 24 July at Parque Nacional Agripino Teniente Enciso.

Roosting call.—At dusk a melodic liquid *fLI-la-lu* may be delivered 2–3 times with five-second pauses between each phrase, followed immediately by a somewhat lower pitched (by *c*.1 octave) *fLU-la-lu* also delivered up to three times. Possibly, this voice is an antiphonal duet and sexually dimorphic, perhaps also serving as a signal between birds going to roost.

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